SPECIAL PUBLIC NOTICE

US Army Corps of Engineers®

MITIGATION GUIDELINES AND MONITORING REQUIREMENTS

LOS ANGELES DISTRICT

Public Notice/Application No.: 970031200-SDM
Comment Period: November 20, 2001 through December 20, 2001
Project Manager: Spencer D. MacNeil, D.Env.

Location

These Mitigation Guidelines and Monitoring Requirements would be applied throughout the Los Angeles District, which includes all of the State of Arizona and portions of California (see attached drawing), specifically San Diego County, Imperial County, Riverside County, San Bernardino County, Orange County, Los Angeles County, Ventura County, Santa Barbara County, the coastal slopes of San Luis Obispo County, eastward of the crest of the Sierra Nevada in Inyo County, eastward of the crest of the Sierra Nevada in Mono County to the Conway Summit, and the southern slopes of the Tehachapi Mountains in Kern County. If modifications occur to Los Angeles District boundaries in the future, these Mitigation Guidelines and Monitoring Requirements would apply to all areas within the revised Los Angeles District boundaries.

Activity

Current regulations allow the use of compensatory mitigation for unavoidable impacts to wetlands and other jurisdictional "waters of the United States." The Corps is aware of problems with previous compensatory mitigation sites and is committed to improving the success of future compensatory mitigation projects. These Mitigation Guidelines and Monitoring Requirements are designed to assist applicants with all aspects of the mitigation process and to provide information to ensure future compensatory mitigation sites replace lost wetland functions and values successfully. Previous versions of the Los Angeles District Mitigation and Monitoring Guidelines have been modified and incorporated into this publication.

The Los Angeles District is soliciting comments on these Mitigation Guidelines and Monitoring Requirements. All comments will be analyzed and used to develop the final Mitigation Guidelines and Monitoring Requirements, which will be published in a second Public Notice. Once the final Public Notice is published, these Mitigation Guidelines and Monitoring Requirements will be available for use by the general public and by LAD Regulatory Project Managers. The rationale is that these Mitigation Guidelines and Monitoring Requirements, developed from past experience, field investigations, and public input, will be the next step in the process to improve the success of compensatory mitigation projects in the Los Angeles District. Comments should be mailed to:

U.S. Army Corps of Engineers, Los Angeles District
Ventura Field Office
ATTN: CESPL-CO-RN-97-00312-SDM
2151 Alessandro Drive, Suite 110
Ventura, California 93001-3766

Alternatively, comments can be sent electronically to: Spencer.D.MacNeil@usace.army.mil.

For additional information, please call Dr. Spencer D. MacNeil of my staff at (805) 585-2147. This Public Notice is issued by the Chief, Regulatory Branch.

I. INTRODUCTION

A. PURPOSE

These Mitigation Guidelines and Monitoring Requirements provide the mitigation sequence applicants must use in examining their projects, guidance on preparing compensatory mitigation plans for unavoidable impacts to the aquatic environment including development of success criteria, and the elements required in the preparation of monitoring plans for compensatory mitigation sites. This document is divided into two parts to address the difference between Mitigation Guidelines and Monitoring Requirements. The Mitigation Guidelines are based on previously developed Habitat Mitigation and Monitoring Guidelines, published scientific data, and staff experience, including functional assessments of previous compensatory mitigation sites. This information is provided to assist applicants with the development of successful compensatory mitigation sites. Monitoring plans will be a required part of any Corps permit requiring compensatory mitigation, and all compensatory mitigation sites will be subject to compliance inspections by Corps Project Managers.

B. MITIGATION POLICY

The U.S. Department of the Army and the U.S. Environmental Protection Agency (EPA) formulated policy and procedures to be used in determining the mitigation necessary to demonstrate compliance with the Clean Water Act Section 404(b)(1) Guidelines (40 CFR 230) (the Guidelines). This information is provided in the "Memorandum of Agreement (MOA) Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines," dated February 7, 1990 (sequencing MOA). The Guidelines allow Standard Permit issuance for only the least environmentally damaging practicable alternative. The Guidelines state that no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. Practicability is defined in terms of cost, logistics, and existing technology in light of the overall project purpose. The burden to demonstrate compliance with the Guidelines rests with the permit applicant. For non-water dependent discharges into special aquatic sites, there is a presumption that less environmentally damaging practicable alternatives are available. If the applicant has complied with the Guidelines by first evaluating alternatives that would avoid impacts, and then taken appropriate and practicable steps to minimize adverse impacts to the maximum extent practicable, then compensatory mitigation is required for the unavoidable impacts. This sequencing MOA is fundamental to the administration of the Corps' regulatory program.

Mitigation has been defined by the Council on Environmental Quality in the National Environmental Policy Act (NEPA) regulations (40 CFR 1508.20) as:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations

during the life of the action; and

- compensating for the impact by replacing or providing substitute resources or environments.

The sequencing MOA between the EPA and the Department of the Army states that the applicant must first provide documentation of:

- avoidance of the impacts;

- minimization of remaining impacts;

and finally,

- compensation for lost functions and values.

Simply, an applicant must first show evidence of attempts to avoid and minimize impacts on the project site, before the Corps will consider whether to accept compensatory mitigation for the remaining impacts. In cases where a Standard Permit is required, the applicant will provide documentation of these efforts through an analysis of alternatives in accordance with the Section 404(b)(1) Guidelines. Typically, the Guidelines are provided to the applicant early in the Standard Permit application process to ensure the applicant is aware of the avoidance, minimization, and compensatory mitigation sequence that must be followed to complete the Section 404 permitting process.

C. CORPS POLICY

As stated in the sequencing MOA, the goal of the Clean Water Act and the Guidelines is to maintain and to restore the physical, chemical, and biological integrity of the Nation's waters. The Corps strives to avoid adverse impacts to waters of the United States, and to achieve a goal of no net loss of wetland functions and values. To achieve these goals, compensatory mitigation is generally required at a minimum 1:1 replacement ratio. This replacement ratio is often increased in consideration of a number of factors including the scarcity of the habitat to be impacted, the results of an assessment of the functions and values found in the habitat to be impacted, any temporal loss of habitat caused by a delay in the construction of a compensatory mitigation site, the use of an artificial irrigation strategy as a replacement for natural hydrologic processes, and the inclusion of an adequate margin of safety to reflect the expected degree of success associated with the compensatory mitigation plan. As shown in a recent study of Orange County compensatory mitigation sites (Sudol, 1996), these compensatory mitigation sites have not fully replaced losses in system functions. This study demonstrated that many compensatory mitigation sites lack natural hydrology, which compromises their capacity to perform a range of functions expected for the habitat being mitigated. Results from this and other studies as well as the experience of regulators throughout the U.S. underscore the importance of including an adequate margin of safety in arriving at a replacement ratio. The margin of safety included by the Corps can be reduced by completing compensatory mitigation in advance of or concurrently with the impact, locating the compensatory mitigation site near the impact site, and ensuring that the compensatory mitigation sites are protected from subsequent loss or degradation. However, on-site compensatory mitigation is not always practicable or “best” for the aquatic resources. In general, the use of approved mitigation banks or in-lieu fee programs as a means of aquatic resource compensation is viewed favorably by the Corps, if it is environmentally preferable and more practical than on-site compensatory mitigation.

The applicant should contact the Corps as early in the project development process as possible. The Corps encourages all applicants to hold pre-application meetings with the Corps and other resource agency representatives. During these meetings, the Corps and the resource agencies can evaluate preliminary project designs and provide information on avoidance and minimization opportunities, as well as potential compensatory mitigation requirements. The applicant should coordinate with the Corps in the selection of potential compensatory mitigation sites and on the development of compensatory mitigation plans, before sites are purchased or the plans are finalized. It is important to note that payments made prior to the Corps permit decision are generally considered “sunk” costs, and regulatory guidance requires Corps Project Managers exclude these costs in the evaluation of the practicability of a project or the associated compensatory mitigation plan. Likewise, payments by developers to an Assessment District, which can be based on assumptions of the number of housing units per area, to facilitate construction of schools, roads, and other infrastructure are generally treated by the Corps as “sunk” costs in evaluating practicability of project alternatives. These assumptions are speculative and are often determined without consulting with the regulatory agencies to determine if they are permittable in consideration of the environmental resources potentially present.

Compensatory mitigation will be required for most Corps authorizations. For Standard Individual Permit applications, the applicant should submit a conceptual mitigation plan along with the formal application materials. This plan should include information on how on-site impacts would be avoided and minimized. Generally, a draft mitigation plan should not be completed until the Corps has accepted a final jurisdictional map, which must also identify project impacts. The final mitigation plan will generally be submitted following the public comment period and Corps review of the draft alternatives analysis. If an applicant requests verification of a project's qualification for a Department of the Army Nationwide Permit or a Regional General Permit, and proposes compensatory mitigation, a detailed draft mitigation and monitoring plan must be submitted with the request for verification. The final submittal of all mitigation and monitoring plans should be in a SINGLE document. It should contain up-to-date versions of all materials, even if other versions were submitted earlier in the application process. It should include the preparer’s identity (if not the applicant) and the date of the final submission. For Letters of Permission, which is the other type of Individual Permit, the Corps may or may not require compensatory mitigation; the Corps should be contacted prior to the submittal of an application to determine if compensatory mitigation would likely be required.

D. COMPLIANCE ASSURANCES

An applicant may be required to provide a letter of credit, performance bond, or special funding to ensure attainment of final compensatory mitigation success criteria stated or referenced in Section 404 permit conditions. The monetary value of the letter of credit or performance bond will be determined by the Corps, based on an estimate of the total cost of the proposed compensatory mitigation project provided by the applicant. The value of the bond may also depend on the use of artificial irrigation on the proposed site in-perpetuity or any time delay between the project-related impacts and the construction of the compensatory mitigation site. The value of the bond or letter of credit may be increased by 20%, or more, if the applicant has had a past history of failed or incomplete compensatory mitigation projects. The estimate of the cost of the compensatory mitigation project shall include, at a minimum, the costs associated with site preparation, vegetation acquisition, irrigation, monitoring efforts, maintenance, contingency measures, and performance reports. This estimate is a required part of any mitigation plan, regardless of the requirement for a performance bond or letter of credit.

E. PROTECTION OF COMPENSATORY MITIGATION SITES

In many cases, the Corps requires in-perpetuity protection of compensatory mitigation sites. The decision regarding whether to require in-perpetuity protection is based on several factors, such as the size, quality, and location of the compensatory mitigation site. This protection typically occurs through the recordation of a Conservation Easement, a Deed Restriction, or as a part of a development's Covenants, Codes, and Restrictions. The Los Angles District Regulatory Branch has a template Conservation Easement and a template Deed Restriction, which are to be used when either a Conservation Easement or a Deed Restriction, respectively, is required.

F. PERSONS TO CONTACT WITH QUESTIONS

For answers to questions regarding the interpretation of these Mitigation Guidelines and Monitoring Requirements or acceptable compensatory mitigation for a specific project, contact your Corps Project Manager within the Regulatory Branch of the Los Angeles District:

Los Angeles District Office	(213) 452-3407 / 3409
Ventura Field Office	(805) 585-2140
San Diego Field Office	(858) 674-5387
Phoenix Field Office	(602) 640-5385
Redlands Field Office	(909) 794-7704
Tucson Field Office	(520) 584-4486

II. BACKGROUND: WETLAND HABITAT AND OTHER WATERS OF THE U.S. WITHIN THE LOS ANGELES DISTRICT

A. INTRODUCTION.

The Corps regulates the discharge of dredged or fill material into jurisdictional "waters of the United States," including wetlands. Project-related impacts generally affect the various hydrologic, biogeochemical, and habitat functions that occur within the jurisdictional limits of the site. The functions or processes performed by habitat can provide or foster the development of characteristics that society values. Compensatory mitigation must replace lost functions and values at the proposed compensatory mitigation sites. The type of habitat that exists at the proposed impact site will determine the type of compensatory mitigation required. The following aquatic habitat discussions are intended to provide Los Angeles District applicants with information to consider when developing compensatory mitigation for these habitat types:

1. Riparian Habitat

Riparian habitat exists along many stream courses in the Los Angeles District (note that standing water or lentic habitats are separately discussed below). In most cases, intermittent and ephemeral stream courses do not contain sufficient water to allow jurisdictional wetlands (as defined in USACE, 1987) to form. However, the majority of these streambeds exhibit the physical features of jurisdictional “waters of the United States” (33 CFR 328.3). Many streambeds considered jurisdictional “waters of the U.S.” have riparian habitat of one type or another associated with them. In the Los Angeles District, substantial riparian habitat occurs outside Corps jurisdiction (and therefore, does not require a Corps permit), but it receives State protection from either the California Department of Fish and Game or the Arizona Department of Game and Fish. Riparian habitat generally occurs along stream banks where soils are fertile and water is abundant for at least some portion of the year (Faber *et al.*, 1989). The term "riparian" has been defined as:

> *"The riparian zone is the border or banks of a river or stream, or the area influenced by that river or stream. Riparian zones support diverse and abundant terrestrial wildlife species, protect stream banks and adjacent land from erosion, and contribute significantly to aquatic communities by providing shade, cover from predators, nutrients, a buffer from nearby land use activities, and a filter for overland soil erosion." (California Rivers Assessment, 1994).*

The presence of moving water has some very important physical effects on the surrounding habitat in the arid environment of southern California and Arizona. Riparian habitats, especially in the arid southwest, exhibit the majority of the functions and values present in wetland systems (Brinson *et al*., 1981). Their value to native wildlife in the Pacific Southwest could be greater than previously thought (Brode and Bury, 1984; Warner and Hendrix, 1985; Knopf *et al*., 1988; Faber *et al*., 1989; U.S. Department of the Interior, 1994). Recent studies have concluded that western riparian habitats could be more important, on an acre-for-acre basis, than wetlands in regions with greater precipitation (U.S. Department of the Interior, 1994). Many of the riparian areas in southern California and Arizona are narrow, linear strips within the more arid habitats of chaparral and sage scrub. Along the coast of southern California, these riparian zones create a complex web of stream channels leading from hilltops down to the ocean and function as wildlife corridors and linear oases with respect to surrounding arid, upland regions (Warner and Hendrix, 1985). Water does not generally flow in these streams year-round, but the presence of groundwater below these riparian strips often allows vegetation to grow throughout the dry Mediterranean summer. The resulting microclimate within these areas provides habitat for species that would not otherwise survive the summer (Brode and Bury, 1984). In general, species diversity is higher in the riparian areas than in neighboring upland areas (Warner and Hendrix, 1985).

Overall, riparian habitats have declined 90-98% in western areas (Warner, 1983; Swift, 1984; Warner and Hendrix, 1985; Faber *et al*., 1989; U.S. Department of the Interior, 1994). In California, approximately 350,000 acres of riparian habitat remained in 1980 (Brinson *et al*., 1981; Swift, 1984). Specific information on the Sacramento River documented a 98% loss of riparian habitat since the 1800's (Swift, 1984). The loss of riparian habitat in the Central Valley has been close to 90%, with only 100,000 acres estimated to remain (Jones and Stokes, 1987). Approximately 49,000 acres of the existing habitat could be categorized as degraded, and the remainder has been impacted to some extent by human activities (Katibah, 1984). Estimates for the loss of riparian habitat in southern California have been complicated by difficulties in aerial photo-interpretation (Faber *et al*., 1989).

2. Lake / Pond Habitat (Source: Cowardin *et al*., 1979, although for simplicity, no distinction has been made in the following discussion between lacustrine and palustrine habitats)

In southern California and Arizona, the climate is not conducive to the creation of permanent lakes with year-round open water. The few natural lakes and ponds within the Los Angeles District that have water throughout the year are generally supported by groundwater seeps or springs. Many of these lakes are shallow and dry up completely in drought years. The majority of the existing lakes and ponds in the region have been created and are supported or maintained by human activities.

While lake and pond habitat often have a similar appearance to riparian habitat along streams, there are notable differences. Many of these differences are attributable to hydrodynamics or the movement of water. Riparian habitat, as defined above, is generally supported by flowing water, while lake / pond habitat is supported by water that is still or is moving slowly. In the Los Angeles District, water typically moves through stream channels quickly and infrequently, resulting in scouring of stream habitat and limited detention. In contrast, lake / pond habitat is generally associated with depressions or dammed river channels where the water is slowed and detained for long periods after the ebb of the flood flows. As a result, many lakes and ponds in the Los Angeles District exhibit a fully expressed transition from an aquatic regime to full upland; with a transition from open water, to emergent herbaceous vegetation, to trees and shrubs, and finally, to upland vegetation. While each zone may not be present at all lakes / ponds, they represent the most common expression of the transition zone. The presence of open water results in a zone of saturated soils, which restricts the establishment of vegetation. The width of this zone is dependent on the slope of the edge and the supply of water. In many cases, the water levels fluctuate throughout the year. Some smaller ponds and lakes will dry up, with larger ponds or those with a perennial water source remaining wet throughout the year. This cycle of open water in the winter and spring and dry mud flats in the late summer and fall are characteristic of lake / pond habitat within the Los Angeles District.

While many lakes and ponds may dry up periodically, there is usually enough water to meet the hydrology parameter of the regulatory definition of a wetland. Those areas where hydric soils and hydrophytic vegetation are also present are regulated as jurisdictional wetlands. In most cases, some portion of a specific lake or pond is jurisdictional wetland. Playa lakes, which tend to occur in desert areas in the Los Angeles District, are notable exceptions; nevertheless, many of these lakes are still considered “waters of the U.S.”

The limits of the jurisdictional wetland may extend out of the saturated zone, depending on the slope and fluctuation of the water levels. Because wetlands are common along lakes and ponds, many proposed impacts to lake / pond habitat will be evaluated under the Corps’ Standard Permit procedures, which will involve an analysis of alternatives pursuant to the 404(b)(1) Guidelines. In those cases where wetland habitat would be impacted by a non-water dependent activity (e.g., housing), the applicant is required to rebut the presumption that there is a less damaging, practicable alternative that does not impact wetlands or other special aquatic sites.

The limit of Corps jurisdiction within lakes and ponds will generally be the Ordinary High Water Mark (OHWM) associated with the upper limit of winter floods, unless adjacent wetlands are present. In the case of natural and some man-made lakes and ponds, the location of the OHWM will be determined through normal field investigations. For larger lakes and reservoirs, the OHWM can be determined by the average annual water level for the past 20-30 years, depending on the records. If jurisdictional wetland occur adjacent to the OHWM, the Corps’ jurisdiction extends to the outer limit of the jurisdictional wetland.

The formation of natural lakes and ponds has been associated with the flooding of existing depressions and the dynamic hydrologic processes within and adjacent to riparian systems. Prior to widespread agricultural and urban development, there was extensive wetland and riparian habitat within southern California. Many of these systems included large areas of low-lying floodplain, some with groundwater seeps or artesian springs. Within in-channel or off-channel depressions, back-water areas, or within areas formed by debris dams, seasonal lakes and ponds formed during and after the winter rains. These lakes and ponds were transitional features for the most part, being formed and destroyed through the natural hydrologic processes that exist along un-constrained river courses. With large-scale agricultural and urban development, many natural processes have been eliminated from the landscape, resulting in the loss of the majority of natural lakes and ponds. However, the development also resulted in the creation of lakes and ponds as water supplies, for flood retention, and for recreation. The habitat surrounding these man-made lakes and ponds is similar to that of natural ponds but without the dynamic hydrologic processes.

Proposed impacts to natural, seasonal ponds and lakes within the Los Angeles District is discouraged because there are so few remaining. As an example, within Orange County, there may be only three natural lakes remaining within the entire county. Preservation of these few remaining systems is a priority of the District, and proposed impacts to them would likely require Standard Permit review. The requirements to rebut the presumption that there is a less damaging practicable alternative will likely be more stringent in the case of proposed impacts to natural ponds and lakes.

Compensatory mitigation required for proposed impacts to lakes and ponds will depend on the location of the proposed lake / pond and the source of water. While it may appear relatively straightforward to excavate a basin, fill it with water, and plant the edges, creation of lakes / ponds and the surrounding edge habitat is more difficult. Issues that must be addressed in the proposed compensatory mitigation plan should include:

- Soil characteristics to ensure there is no excess infiltration
- Quality of the water entering the lake / pond (e.g., no excessive sediment)
- Quantity of water entering the lake / pond
- Overflow outlet with erosion controls
- Sufficient and appropriate buffer habitat
- Maintenance plan, including provisions for sediment-removal and non-native plant species eradication
- Plant palette with appropriate native species

3. Vernal Pools

Vernal pools, which can occur singly or in complexes, are best defined as seasonally flooded landscape depressions underlain by a subsurface layer (e.g. clay or other impervious soil or rock layer) that limits infiltration of water (Holland, 1976). Vernal pools can usually be distinguished from uplands by a distinct change in vegetation and soil characteristics. Direct precipitation appears to be the primary water source for vernal pools, but overland runoff and groundwater in seasonal perched water tables may also be important (Jokerst, 1990). The impervious substrate of vernal pools is hardpan, claypan, basalt, or other materials that prevent downward percolation of water (Thorne, 1981). These soils and California's Mediterranean climate contribute to the most striking characteristic of vernal pools, which is periodic or continuous ponding during the late fall, winter, and early spring, followed by desiccation during the dry season (Holland, 1976; Zedler, 1987; Holland and Jain, 1988; Jokerst, 1990). Vernal pools support specialized assemblages of flora and fauna, including a relatively large number of federally listed as endangered or threatened species (Cheatham, 1976; Zedler, 1987; Holland and Jain, 1988).

Vernal pools are one of the most, if not the most, endangered wetland habitat types in California's landscape. It has been estimated 97% of the historic vernal pools in southern California have been destroyed. In southern California, few vernal pools remain in urbanized areas. The majority of the remaining vernal pool complexes are found in undeveloped areas. Because they are usually found in flat areas, most remaining vernal pools, which are not already preserved as mitigation for past impacts or through formal reserves, are subject to intense developmental pressure.

Depending on the size of the depression, the amount of rainfall and climate conditions following rainfall, a pool will remain inundated for a week to several months before drying. The period of soil saturation is also variable. Because of the unusual ecological situation created by the drastic seasonal change from wet to dry, only plants and animals especially suited to the ephemeral nature of vernal pools routinely occupy the habitat. Species inhabiting vernal pools must be able to tolerate the wide range of hydrologic conditions and / or complete their life cycles (grow and reproduce) in the short time when the pool provides a suitable environment (Zedler, 1987). Vernal pool biota also varies from year to year in response to the amount and distribution of rainfall (Jokerst, 1990).

While the number of plant species found in a typical vernal pool is low (15-25 species) (Holland, 1976; Taylor, 1992), data suggest that vernal pools support plant species uniquely adapted to the variable hydrologic conditions. The majority of these species are endemic to southern California (Stone 1990), and many have been listed as rare, threatened, or endangered species (Skinner and Pavlik, 1994). Nearly 200 plant species (predominantly annuals) are known to be restricted to, or commonly associated with, vernal pools. Of these, 91% are considered native to California, and 55% have ranges entirely within the state (Holland, 1976). Vernal pools also support a specialized suite of animal species with life histories enabling them to inhabit the highly variable vernal pool ecosystem. Animal species observed in vernal pools include a variety of crustaceans (e.g. fairy shrimp, clam shrimp, and tadpole shrimp) and insects (e.g. beetles and solitary bees). Vernal pools also act as breeding and foraging habitat for many vertebrate species including the more conspicuous spadefoot toads and tiger salamanders. Vernal pools are utilized by migratory wading and shorebirds for resting and foraging, and by mammals as water sources and potential forage sites.

Vernal pools contain highly diverse assembleges of species, because of their size and separation. Each individual pool is similar to an island. Generally, the larger the size of the pool and the shorter the distance to the nearest adjacent pool, the more species that may inhabit it. Vernal pools occurring very close together and appearing very similar can support a very different suite of animals and plants, and the same pool can support different plants and animals in different years due to differences in the pattern and the amount of rainfall. Species can move between pools by waterfowl and shorebirds, which can transport dormant seed and eggs from one location or region to another, either internally in food, or attached in mud to their legs or feathers.

A functioning vernal pool ecosystem is complicated, and its viability depends on maintaining more than just the areas that fill with water. Maintenance of a viable vernal pool is dependent on preservation of the surrounding watershed. Most pools are formed through direct precipitation and run off from the immediate watershed. As the surrounding upland habitat is degraded or destroyed, the indirect effects on the decrease or increase in runoff to the pool can have significant impacts. Along with changes to the amount of runoff, modification of the watershed usually results in the addition of pollutants into the pool. Even a small change in the watershed of a vernal pool can result in significant impacts to the down-slope pool.

In addition to protection of the immediate watershed, an adequate variety and distribution of pools must be preserved to provide habitat for different vernal pool species, to allow dispersal and re-colonization of vernal pool biota, and to provide habitat during years with different rainfall patterns. As the amount of upland or wetland habitat associated with vernal pools at a site is degraded or destroyed, the viability of the pools and their biota can be impaired due to disruption of hydrology, decreased nesting habitat available for pollinators, decreased summer habitat for amphibians, or decreased attractiveness to waterfowl (dispersers of vernal pool plants and invertebrates).

As a result on the U.S. Supreme Court's January 9, 2001 decision on the SWANCC case, many vernal pools are not within the Corps' jurisdiction pursuant to Section 404 of the Clean Water Act. Applicants considering or proposing to impact a vernal pool are strongly advised to contact the Corps to determine whether the specific vernal pool proposed for impact is within Corps jurisdiction. The Los Angeles District of the Corps has proposed a regional condition that would require an applicant to obtain a Standard Permit for any impact to a jurisdictional vernal pool. Because jurisdictional vernal pools are considered wetlands, the Standard Permit requirement would require an applicant proposing an activity that is not water-dependent (e.g., housing) to rebut the presumption that a less environmentally damaging, practicable alternative is available to the proposed project. The increased sensitivity of vernal pools will make this requirement more difficult to satisfy in the near future. As a result, the Los Angeles District of the Corps is stressing total avoidance in order to protect the remaining jurisdictional vernal pools. If total avoidance is not practicable, the Corps will require compensatory mitigation, with the first priority being the restoration or enhancement and preservation of other vernal pools on the project site. The objective is to restore or enhance existing vernal pools within the same area. The second priority will be the restoration or enhancement and preservation of vernal pools within the same complex. The third priority will be the restoration or enhancement and preservation of vernal pools in another complex as near as possible to the impact area. In very rare cases, preservation of high functioning and/or highly valuable vernal pools may be accepted as compensatory mitigation for project impacts; but the Corps will set a high mitigation ratio. In general, the creation of vernal pool habitat within off-site areas is not accepted due the difficulty in creating vernal pool habitat.

Because of the ever-increasing scarcity of vernal pools in southern California, it is becoming very difficult and expensive to find compensatory mitigation for unavoidable impacts, especially in urbanized areas where most remaining pools (and their watersheds) are under the greatest developmental pressure. This situation has lead to the destruction of many of the remaining vernal pool complexes. The combination of the sensitive nature of the habitat, the scarcity of the remaining pools, and the large number of threatened and endangered species increases the need to avoid any impacts to the remaining vernal pools. Because most vernal pools in southern California support federally listed threatened and endangered species, most proposed impacts also have to be approved by the U.S. Fish and Wildlife Service through the Endangered Species Act's Section 7 or Section 10(a) process.

4. Slope Wetlands (from PCR Services Corporation, 2000)

Slope wetlands are exceedingly rare in the Los Angeles District, due to their specific formative requirements and the rapid urbanization of the landscape. Slope wetlands are normally found where there is a discharge of ground water to a sloping land surface. Elevation gradients may range from steep to slight and can occur in nearly flat landscapes if ground water discharge is a dominant source to the wetland surface. Principle water sources are usually ground water return flow, interflow from surrounding uplands, and precipitation. Hydrodynamics of slope wetlands are dominated by downslope unidirectional water flow. Water losses are primarily by saturation and subsurface discharge to the soil, surface flows, and by evapotranspiration. Slope wetlands may develop channels, but the channels generally serve only to convey water away from the slope wetland following periods of heavy precipitation. (Brinson *et al.*, 1995). The plant communities in slope wetlands can be emergent or scrub-shrub depending on the hydroregime and soil type.

Using the Cowardin classification system, slope wetlands are considered palustrine systems, which are generally defined as

> "nontidal wetlands dominated by trees, shrubs, persistent or nonpersistent emergents, mosses or lichens, and such wetlands in tidal areas where salinity from ocean-derived salts is below 0.5 ppt. Also included are wetlands that lack vegetation but (1) are less than 8 hectares, (2) lack wave-formed shorelines, (3) have water depths less than 2 meters (6.6 feet) at low water, and (4) have salinity due to ocean derived salts less than 0.5 ppt. Wetlands of the Palustrine System are generally bounded by upland or other classes of aquatic habitats" (Cowardin, 1979)

In central and southern California, palustrine wetlands include habitats and/or biotic communities that have been called freshwater marshes or palustrine emergent wetlands, alkali flats, seeps and springs, and dune swales. Because of the Mediterranean climate of the region, many of these wetlands are characterized by temporary or seasonal flooding, or by seasonally or permanently high water tables with little or no surface flooding.

According to the Ferren classification (Ferren *et al.*, 1996), the slope wetlands in southern California would be generally classified as *Palustrine, Class 50.240, Emergent Wetland* (both persistent and non-persistent), which includes freshwater and alkali marsh types dominated by genera such as *Carex* (sedges), *Eleocharis* (spike-rushes), *Juncus* (rushes), and *Scirpus* (bulrushes). Several of the slope wetlands that are less persistently saturated may be classified as *Class 50.250, Scrub-shrub*. Many of southern California's slope wetlands fall into one of two Palustrine Hydrogeomorphic Units used in Ferren classification system:

> *(.710) Seeps*, which generally do not have surface flow, are usually seasonally or permanently saturated, and occur in the context of drainage heads, bluffs and slopes;
>
> *(.720) Springs,* which occur similarly to Seeps, but are characterized by the emergence of flowing water for at least part of the year.

All wetlands perform a combination of hydrologic, biochemical, and biologic functions (Brinson *et al*., 1993; Smith *et al*., 1995). The manner and degree to which a specific wetland performs each function varies based on the subclass and location of the wetland. Specific functional assessments typically focus on the subset of the functions that are most likely to be performed by the wetland class being evaluated.

In southern California, eight generic functions are typically performed by slope wetlands. These eight functions consist of two hydrologic functions: Ground Water and Surface Water Interception and Water Retention and Ground Water Discharge; three biochemical functions: Organic Carbon Accumulation and Export, Retention and Release of Elements and Compounds, and Nutrient Cycling / Transformation of Compounds; and three biologic functions: Maintenance of Characteristic Plant Community Composition / Structure, Maintenance of Characteristic Faunal Community Structure, and Maintenance of Regional and Landscape Biodiversity. The identification of these functions is derived from the information discussed in the *Characterization and Functional Assessment of Reference Wetlands in Colorado* (Colorado Geological Survey, 1998) and the draft *National Guidebook for Application of Hydrogeomorphic Assessment in Slope Wetlands* (USACE, unpublished). The HGM guidebooks provide the relevant functions occurring in wetlands nationwide.

5. Salt / Brackish Marsh

Coastal marshes are generally recognized by biologists and the public as among the most productive and the most impacted habitats in southern California. Despite a dearth of data on past wetland habitat compositions, it is known southern California historically had extensive salt marshes and brackish marshes (Josselyn and Chamberlain, 1993; Zedler, 1996). Southern California salt marshes occupy coastal areas with high salinity (>30 ppt); coastal brackish marshes develop in regions of freshwater and saltwater mixing (0.5-30 ppt) (Zedler, 1984). Southern California salt marshes share certain characteristic features that are worth noting. Generally, the region's salt marshes exhibit a positive slope (1-2%) from the direction of a tidal-flushing water body, with variations in salinity occurring along the elevational gradient (Zedler, 1984). The area between mean sea level and mean lower low water is typically mudflat habitat, which is an area inhabited by diatoms, algae, and a variety of invertebrates (Faber, 1990). The lower marsh zone extends from the upper limit of the mudflat (where the upright herbaceous vegetation is observed) up to the point that is inundated twice a day by high tides. This zone tends to have salt concentrations similar to seawater (~34 ppt), which is generally lower than concentrations in the middle and upper zones. *Spartina foliosa*, less common in southern California than in northern California marshes, tends to dominate the lower-salinity, inundated lower-marsh zone. In contrast, the middle zone, which extends from mean high tide to mean higher high water, favors the growth of more inundation-intolerant species, such as *Salicornia virginica* (Faber, 1990). *Distichlis spicata*, *Frankenia grandifolia*, *Monanthecloe littoralis*, *Salicornia subterminalis*, and *Salicornia virginica* are common residents in the high-zone salt marsh (i.e., extending from mean higher high tide to extreme high tide), which is the driest portion of the salt marsh. Species in this zone tolerate inundation that occurs at a frequency of once or twice a month (Faber, 1990). Sparsely vegetated salt pans typically occur in the highest portions of this zone. Tidal creeks often cut across the various zones, bringing in water with salinity equal to or less than ocean water (Faber, 1990). These creeks develop from minor irregularities in the marsh plain (MEC, 1993). Inundation-tolerant species generally inhabit the tidal creek banks. Overall, southern California salt marsh plant species compositions vary, but the list is restricted to about 20 common species (Zedler, 1982). The species generally occupy the distinct low, middle, and upper marsh zones and are associated with specific habitat types.

In restoring, enhancing, or creating salt marsh habitat, key considerations are elevation, hydrologic regime, and soil. Changes in elevation or hydrology are key considerations because of their effects on wetland vegetation (Zedler, 1982; Josselyn and Buchholz, 1984; PERL, 1990 and 1996). Wetland vegetation abundance, associations, and architecture in turn, determine what wildlife will inhabit a particular wetland (Zedler, 1982; PERL, 1990 and 1996). Soils determine water-percolation rates, provide the growing medium for plants, provide evidence of site-use history, and reveal the extent of groundwater fluctuation. Southern California wetland soils are characteristically fine-grained, with high organic matter and total nitrogen (PERL, 1996). These features have been difficult to emulate in artificial marsh soils, which frequently have had a dredge spoil or upland source (Langis *et al*., 1991; Gibson *et al*., 1994; PERL, 1996). Supplementation with amendments has provided limited success. Apparently, the amendment nutrients leach out or are decomposed too rapidly for long-term stability (Langis *et al*., 1991; Gibson *et al*., 1994; PERL, 1996). Without adequate soil, wetland restoration will achieve limited success at best (PERL, 1996). Therefore, soil must be carefully considered in effecting salt marsh compensatory mitigation.

6. Alkali Wetlands (from PCR Services Corporation, 2000)

"Persistent, emergent, alkali marsh in a riverine geomorphic setting" or riv-pam wetlands are fairly characteristic of the historic geologic and climatic conditions in California's coastal watersheds. The combination of sedimentary material of marine origin and the inherent geologic instability of coastal southern California are conducive to formation of zones where saline or alkaline water is discharged from fractures in bedrock. The Mediterranean climate and proximity to coastal areas with seed source of alkaline plants allows establishment of alkaline marsh and meadow habitats in canyons with requisite geologic and edaphic conditions.

Historically, riv-pam wetland probably had a fairly wide distribution in cismontane central and southern California (including Baja). As with most wetlands, their occurrence has been reduced by encroachment of urban development into hillside areas. Riv-pam wetlands probably still enjoy a fairly broad distribution, but are likely confined to small, localized populations, each with slightly unique characteristics based on the local conditions in which it exists.

In southern California, the distribution is focused in southern, coastal Orange County, primarily in the Capistrano / Monterey and Sespe / Silverado geologic formations. In Orange County, there are probably fewer than 20 locations where riv-pam wetlands occur. They exist primarily in the San Juan Creek and San Mateo Creek watersheds and in the San Clemente Hydrologic Association. The Orange County riv-pam wetlands can be subclassified into three groups. Segunda Deshecha is in the most common of the three subgroups, which is characterized by intermediate to narrow channel widths, soils characterized by low hydraulic conductivity, thicker hydric and organic soils, and elevated amounts of dissolved ions. Biologically, the diversity of wetland plants is high for sites in this subgroup relative to other subgroups.

Riv-pam wetlands can be expected to provide many of the functions typically associated with mid-order riverine systems, such as Dynamic Surface Water Storage and Removal of Imported Elements and Compounds (Brinson *et al.*, 1995). The persistently saturated conditions and prevalence of emergent marsh communities are conducive to formation of highly-reduced soils and thick soil organic layers. This results in an increased capacity, relative to more mesic or xeric streams, to perform biogeochemical functions, such as Organic Carbon Export and Nutrient Cycling. Geologic and edaphic factors produce alkaline conditions that support plant communities more typically associated with tidal areas, such as *Distichlis spicata.* Consequently, the floral and faunal support functions are somewhat unique relative to ephemeral or intermittent streams.

7. Vegetated Shallows (Seagrass beds) (Sources: Fonseca *et al.*, 1998; *Southern California Eelgrass Mitigation Policy*, 1991, as amended; Phillips, 1984)

Seagrass ecosystems are protected under federal “no-net-loss” policy for wetlands. Like wetlands, they are recognized as Special Aquatic Sites by the 404(b)(1) Guidelines. Seagrass ecosystems receive this level of protection because they provide many important functions and values.

Seagrass ecosystems are one of the most productive plant communities on the planet. Seagrass meadows provide direct and indirect food sources for marine food chains; they also provide habitat and serve as nursery areas for many marine species. Past large-scale seagrass die-offs have been associated with declines of scallops, fish, clams, crabs, and birds in the die-off areas.

Seagrasses are typically found in shallow, subtidal or intertidal uncolsolidated sediments, but some species occur in the rocky intertidal zone. In addition to their habitat value, seagrasses bind millions of acres of shallow water sediments in coastal waters with their roots and rhizomes while simultaneously baffling waves and currents with their leafy canopy. In this manner, the canopy inhibits resuspension of fine particles and traps water-column-borne material, including nutrients. These nutrients are taken up into plant biomass, which can improve water quality. The physical stability, reduced mixing, and shelter provided by the complex seagrass structure provides the basis for a highly productive and important shoreline ecosystem. Seagrasses occur along all coastal states of the U.S., except Georgia and South Carolina, where growth is discouraged by a combination of high freshwater inflow, high turbidity, and high wave amplitude.

Seagrass habitat can be difficult to define. It can occur as isolated or grouped patches, or in continuous cover beds. Seagrasses also exhibit a variety of growth strategies and coverage patterns, which occur from rocky and soft-bottom intertidal habitats to depths of at least 40 meters. Species such as *Zostera marina* can exist as either perennials or annuals, varying between seed bank and vegetative material depending on time of year; these differences can require very different assessment strategies. Factors compromising the accuracy of one-time surveys include bed-form migration, presence of seed banks, annual populations, recent non-point source anthropogenic impacts (e.g., decreased water clarity), and direct removal of seagrasses. Therefore, one-time inventories are generally inadequate. Because seagrass beds move over time, unvegetated areas between seagrass bed patches are candidates for future colonization. Therefore, effective seagrass management considers vegetated beds as well as any unvegetated areas between seagrass bed patches.

Because of their location in the coastal zone, seagrasses are particularly susceptible to human activity. There is a clear correlation between human development of the shoreline and seagrass decline. Seagrasses are particularly susceptible to nutrient loading (e.g., accelerates growth of light-absorbing algae, which decreases light available to seagrasses), light reduction (e.g., increased turbidity, shading), and mechanical impacts (e.g., propeller scarring, pile driving, dredging, filling). While mortality can happen in weeks or months, recruitment does not typically keep pace. The rate of recovery rates depends on whether seed set and germination can occur (i.e., 1-2 growing seasons) or whether only vegetative encroachment occurs (i.e., can take several years).

Before recovery efforts are initiated at an impacted site, it is important to determine whether the factors leading to the loss of seagrass still occur or are likely to occur. For example, if water quality is believed to be the reason for loss, either the water quality at the site must be improved or an alternative site must be identified for seagrass recovery.

Many seagrass planting techniques have been developed since the 1970's. While it is still not clear what factors are the most important to address to ensure planting success, some guidelines have emerged. Elevation in the tidal zone, current speed, salinity, soil type (sandy, combination, cohesive), and seagrass species are important factors. In addition, seagrasses should not be planted in areas where there is no prior history of their existence. For information regarding seagrass planting and transplantation methods, maintenance, and monitoring in southern California, refer to the *Southern California Eelgrass Mitigation Policy*, dated 1991, as amended (http://swr.ucsd.edu/hcd/eelpol.htm).

III. COMPENSATORY MITIGATION GUIDANCE

The development of any compensatory mitigation project proceeds through several stages. There are certain issues that must be addressed by the applicant at each stage in the process, to increase the probability of a successful compensatory mitigation project. The key stages in the development of a compensatory mitigation project are:

A. Project Site Impact Assessment

B. Compensatory Mitigation Site Selection

C. Compensatory Mitigation Plan Determination

D. Compensatory Mitigation Site Construction

E. Long-Term Compensatory Mitigation Site Maintenance and Monitoring

Within each of these areas, the Corps has identified specific concerns that the applicant needs to consider.

A. Project Site Impact Assessment.

1. An important aspect of any permit application is the assessment of the project site before construction. An adequate assessment of the current functions and values before the construction of the project provides information on the relative value of the resources onsite within the context of the ecosystem. This information will be crucial in determining opportunities for modifying pre-construction plans to avoid and/or minimize impacts to existing aquatic resources. The assessment of the proposed construction site should be accomplished prior to the selection of the proposed compensatory mitigation site or the actual design of the proposed project.

The choice of assessment methodology to be used in the site assessment is determined by the applicant. However, the Corps of Engineers will likely be using the Hydrogeomorphic (HGM) Approach or a similar approach to assess the functional condition of the site for the Corps permit. The HGM approach is used to estimate the capacity of wetlands and other waters of the U.S. to perform specific functions relative to similar types of habitat in the region (Smith *et al.*, 1995). This approach is based on the HGM classification system (Brinson, 1993), which categorized the nation's wetlands and other waters of the U.S. into seven classes, based on fundamental differences in hydrology, hydrodynamics, and geomorphology. During the last several years, the Corps'

Waterways Experiment Station (WES) has been developing National HGM Guidebooks, which provide the assessment models for each of the seven classes. However, regional differences require that these Guidebooks be modified to reflect the conditions occurring in the region of interest. The data generated from applying these Regional HGM Guidebooks can be used to identify appropriate compensatory mitigation ratios for project impacts (Rheinhardt *et al.*, 1997).

The HGM Approach is used to evaluate the habitat in question by scoring a suite of "important" functions that have been determined to classify the particular wetland (Brinson *et al.*, 1995; Smith *et al.*, 1995). These functions are divided into three general subgroups: Hydrology, Biochemistry, and Habitat. Within each subgroup, there are a number of functions that characterize the habitat. Each of these functions is defined by evaluation of one or more variables or ecosystem / landscape attributes that are measured or estimated by measurement of direct or indirect indicators in the field. Each variable is evaluated in the field by either qualitative or quantitative methods and is typically assigned a value between 0 and 1, with 0 representing lack of the indicator with no potential for recovery and 1 representing the highest sustainable indicator level. Each function is evaluated using a pre-derived algorithm or mathematical relationship of one or more variables. Each functional algorithm is developed to produce a functional capacity index (FCI) score ranging from 0 to 1. An FCI score of 1 represents the "highest sustainable" functioning for the region, whereas an FCI score of 0 corresponds to lack of function with no opportunity for recovery under natural conditions. Lists of variables, functions, and the algorithms for each habitat type can be obtained from the Corps offices. However, in many cases, HGM models for particular habitat classes are under development or modification, and only draft functional algorithms and variables are available.

After the numeric values for each of the functions are determined, these FCI scores (unitless) are multiplied by the acres of habitat proposed for impact to determine the Functional Capacity Units (FCUs) occurring at the impact site. The FCUs provide a direct indication of the minimum compensatory mitigation required if the project proceeds as proposed. The Corps can increase this total to account for landscape or regional functions, values provided by the site / ecosystem functions, the timing of the impact relative to the implementation and maturation of the compensatory mitigation, and any factors that could reduce the likelihood of compensatory mitigation success. At this point, the applicant should carefully consider the cost of providing compensatory mitigation in comparison with the cost of avoiding or minimizing impacts from the proposed project.

B. Compensatory Mitigation Site Selection

1. The selection of an appropriate site upon which to construct a compensatory mitigation project has been one of the most neglected aspects of compensatory mitigation planning. In general, the choice of a compensatory mitigation site has been made by the applicant, based on project economics without concerns for the underlying physical characteristics. For proposed riparian compensatory mitigation projects, the most critical criterion to consider in selecting sites is hydrology. In a study of riparian compensatory mitigation sites in Orange County, California, the presence of a natural source of water (e.g., stream channel or lake) was determined to be crucial to the functional success of compensatory mitigation projects (Sudol, 1996). Without a natural source of water, many of the hydrologic functions or processes will occur at low levels throughout the life of the habitat. Based on such studies and the Corps' experience, lack of a natural water source has been the number one physical factor leading to the low rate of success of past compensatory mitigation projects. Therefore, without natural hydrology (e.g., stream or river for riparian habitat), it is highly unlikely the site will achieve full functional success.

In some compensatory mitigation sites, an artificial water source (i.e., irrigation) has been used to attempt to simulate natural hydrology. In most cases, the water source was either drip irrigation, wide spray, or intermittent flooding of the site. An evaluation of Orange County sites where these irrigation methods were employed revealed several critical deficiencies with the sites (Sudol, 1996). First, artificial irrigation does not provide the dynamic and variable nature of water flow normally found in southern California riparian systems. Periodic scour of vegetation, deposition of sediment, and re-colonization by vegetation, are severely restricted in these cases. Without re-colonization, the habitat would probably not survive any large stress or perturbation. Second, the lack of seasonal flows limits the transport of organic matter into and out of the riparian habitat. Without any inflow, the net result of artificial irrigation is transport of organic material out of the compensatory mitigation site. Third, the use of flood or spray irrigation systems on newly cleared land promotes the germination and growth of non-native, invasive plant species. Several of these invasive species can out-compete most understory and herbaceous plants, while one particularly problematic species, giant reed (*Arundo donax*), can displace existing trees and shrubs. Fourth, the lack of a natural stream channel at many of these sites reduces one of the most important functions of riparian habitat: its role as a corridor used by many mammals, birds, and reptiles.

Compensatory mitigation sites that depend on artificial irrigation have been determined to be less than successful, and the Corps strongly discourages the use of artificial irrigation as the main water source. The guidelines published for the establishment of mitigation banks provide specific instruction on this issue. The mitigation banking guidelines state:

> "In general, (mitigation) banks which involve complex hydraulic engineering features and/or questionable water sources (e.g. pumped) are most costly to develop, operate and maintain, and have a higher risk of failure than banks designed to function with little or no human intervention. The former situations should only be considered where there are adequate assurances to ensure success. This guidance recognizes that in some circumstances wetlands must be actively managed to ensure their viability and sustainability. Furthermore, long-term maintenance requirements may be necessary and appropriate in some cases (e.g., to maintain fire-dependent plant communities in the absence of natural fires; to control invasive exotic plant species).
>
> Proposed mitigation techniques should be well-understood and reliable. When uncertainties surrounding the technical feasibility of a proposed mitigation technique exist, appropriate arrangements (e.g., financial assurances, contingency plans, additional monitoring) should be in place to increase the likelihood of success. Such arrangements may be phased out or reduced once the attainment of prescribed performance standards is demonstrated."

These Mitigation Guidelines modify the past policy of acceptance of artificial irrigation projects, by clearly expressing the Corps' concerns with this practice and requiring higher ratios for artificially-irrigated compensatory mitigation sites than previously accepted. Applicants must weigh the potential investment costs of acquiring suitable land adjacent to existing channels for restoration or enhancement relative to creation projects in upland environments, which will likely involve higher costs (considering the potential for higher mitigation ratios and the risk of failing to meet the Corps' success criteria). In addition, it is likely that the applicant will be required to provide assurance (in the form of bonds or irrevocable letters of credit) of perpetual maintenance and water supply, if the Corps is asked to accept artificially-irrigated sites as compensatory mitigation. Applicants should carefully consider expanding efforts to avoid and minimize on-site impacts and attempt to submit plans for self-sustaining compensatory mitigation sites along natural water features, such as stream channels.

2. The practical aspects of site selection for the development of compensatory mitigation for project-related impacts would begin after all reasonable efforts to reduce or minimize on-site impacts have been exhausted. In addition, the sequencing MOA should be followed along with the mitigation priorities developed by the CEQ. Site selection should include and prioritize the following criteria, which relate to aspects of the physical environment:

a. *Natural Hydrology*. Natural hydrology can be exceedingly difficult to establish. The successful determination of proper hydrology will require analysis of existing conditions in reference sites and hydrologic testing of the possible compensatory mitigation sites. This testing should include an examination of the groundwater availability, frequency of flooding, depth / duration / timing of flooding, and determination of tidal ranges in marine habitats. Modification of hydrologic characteristics should be kept to a minimum with the stated goal to have the site be hydraulically self-sustaining and require little or no long-term maintenance.

b. *Wildlife Corridors*. The goal is development of compensatory mitigation projects adjacent to existing high functioning habitats. Even more desirable would be the construction of a compensatory mitigation site that links two or more habitats, which had been previously separated. The use of spatial analysis tools (GIS) on a regional basis could provide valuable assistance in the choice of preferable locations for compensatory mitigation sites. The distance to the nearest area of native vegetation that forms a contiguous link to larger habitat complexes would be an important consideration in the width of the corridor, the value of the habitat to the local wildlife, and it would affect the final mitigation ratio.

c. *Soil Characteristics*. The development of suitable soils at compensatory mitigation sites for the establishment of riparian and salt marsh plants has been neglected in past compensatory mitigation projects. This neglect is somewhat understandable, due to the varied nature of soils and the emphasis on non-wetland compensatory mitigation. Examination of existing reference sites will provide important information on the development of suitable soils for future sites. It is also critical to understand that the development of suitable soils is linked to the establishment of natural hydrology. In sites with artificial irrigation, the placement of large amounts of relatively clean water onto the site results in the net removal of organic material without replacement. This would slow the development of organic soils, which has been noted in several compensatory mitigation sites. In addition, mychorrhizal soil injections should be considered in some cases where wetland creation projects are attempted in areas without appropriate soil conditions. In the case of in-kind compensatory mitigation, soils from the impacted aquatic habitat should be collected and used in the compensatory mitigation projects.

Several of the variables / functions assessed using the HGM approach, related to these physical characterstics, could be used at this point to rank the possible compensatory mitigation sites. The physical characteristics of the site generally are set relatively early in the process and would not change dramatically over time. Comparison of the ranking of specific variables (and in some cases, FCI scores) among candidate sites with the impacts at the project site would provide a valuable preliminary indication of the possible success and cost of compensatory mitigation at each of the sites. For example, if a proposed compensatory mitigation site could be easily restored to high functional capacity for several hydrologic functions, the probability of success for this site would be higher than for a site having only low functional capacity for these same functions with low likelihood for restoration.

3. The applicant should also consider the use of established and Corps-approved mitigation banks and in-lieu fee programs at this point. For certain projects, it would not be practicable to mitigate for relatively small impacts onsite, due to habitat isolation or future development factors. In these cases, the purchase of mitigation credits in existing banks or the payment of in-lieu fees could provide a more practicable option, which could also enhance the regional aquatic environment. However, the final decision to purchase credits from an established bank or in-lieu fee program shall be made by the Corps after examination of all relevant habitat considerations, including landscape-level issues, such as wildlife corridors and habitat-linkage zones.

4. Generally, the physical characteristics of the sites considered determine whether creation, restoration, enhancement, or preservation are viable compensatory mitigation options. The categories of compensatory mitigation, as defined by Lewis (1990) are:

Restoration: return to a pre-existing condition.

Creation: conversion of a persistent non-wetland habitat into wetland (or other aquatic) habitat. Two subdivisions are recognized: Artificial (i.e., irrigation required) or self-sustaining.

Enhancement: increase in one or more functions due to intentional activities (e.g., plantings).

Passive Re-vegetation: allow a disturbed area to naturally re-vegetate without plantings.

Habitat creation projects have the greatest potential, but they also have the highest risks. Creating aquatic habitat in an area where it did not previously exist is a difficult proposition. Restoration projects have had a higher degree of success in the Los Angeles District. Despite the uncertainties associated with creation projects, the Corps usually recognizes creation and restoration equally when it comes to determining compensatory mitigation credit. Enhancement projects generally receive less compensatory mitigation credit, because enhancement targets particular functions or values instead of the full suite of functions performed by that habitat type. Preservation as compensatory mitigation is rarely accepted, unless it is combined with restoration, enhancement, or creation projects. Preservation is essentially avoidance, which is required under the sequencing MOA. Preservation is accepted on occasion, when particularly rare or valuable aquatic habitat is threatened by anthropogenic activities. An example was the establishment of the Barry Jones Wetland Mitigation Bank, near the City of Temecula, in Riverside County, California. The preserved habitat is a large (33 acre vernal pool with approximately 99% or 110 acres of its contributing watershed), intact vernal pool under imminent threat of development. Nevertheless, applicants wishing to purchase credits at this mitigation bank must still provide 1:1 compensatory mitigation onsite for their impacts. Ultimately, the type and location of proposed compensatory mitigation relative to the proposed impacts to the aquatic environment affects the Corps' compensatory mitigation ratio.

C. Compensatory Mitigation Site Design

1. Typically, the choice of the compensatory mitigation site has been made due to financial considerations of the applicant, and the resulting compensatory mitigation design is based on the constraints of the site. However, it would be prudent to evaluate the difficulty and expense of compensatory mitigation development at several locations. As an example, consider the cost of development for two sites. The first site is upland that would need irrigation in-perpetuity but is already owned by the applicant. The second site is located adjacent to an existing stream course but is owned by another party. The initial cost of the second site may be high but could ultimately be more cost-effective, because this site will likely require reduced maintenance over time. The first site, although much less expensive to purchase, could require a large expenditure of funds for maintenance and assurance of irrigation in-perpetuity due to the lack of natural hydrology, which would also probably increase the mitigation ratio. Therefore, before selecting a mitigation site, applicants should examine several sites, develop preliminary design plans, and evaluate the complete costs of each site. The Corps, along with the other resource agencies, would be pleased to provide any information and assistance to the applicant at this point in the process.

Design of the compensatory mitigation is highly dependent on the site selected. The factors used in the preliminary design of the compensatory mitigation site should have a functional assessment basis. If the HGM Approach is used, the variables and functions include most of the critical elements that should be addressed within each compensatory mitigation plan. Also, if the variables and functions are included in the design, it will be much easier to develop success criteria for the final compensatory mitigation project.

2. There are several important features to any successful compensatory mitigation design or plan. Each aspect of the plan must be identified in detail and explained clearly. Although there may be variation in the number of items required for a particular plan, those identified below should be assumed to be the minimum addressed in any compensatory mitigation plan. The items listed below include general guidance that should be addressed in each compensatory mitigation plan.

a. *Clearly define the purpose of the compensatory mitigation project*. Evaluation of past compensatory mitigation plans shows that the purpose of the planned compensatory mitigation project has frequently not been included in the description. Usually, there has been a vaguely-worded statement about restoration of habitat on the compensatory mitigation site. The compensatory mitigation purpose must be clearly identified and include specific statements about type of habitat (and associated functions) to be impacted by the construction project, the functions that would be replaced at the proposed compensatory mitigation site, and any other functions and/or values that are desired (e.g., habitat for federally listed threatened or endangered species). Clearly written purpose statements will provide important information for the approval of the compensatory mitigation plan and the development of success criteria.

b. *Develop a comprehensive hydrology component*. This component should include information about any existing channels, historic flow rates, tidal regimes (if relevant), and topography of the compensatory mitigation site (i.e., before and after any proposed grading). Clearly identify the source, quality, and quantity of water including temporal aspects of any irrigation plan, which may be required in the first few years of a compensatory mitigation site to enhance vegetation establishment. Provide general information on the average amount of water and the variability of this water available to the site during a standard year. If available, include information on the depth of the water table and its variability throughout the year. Project success depends on having sufficient knowledge about the depth, duration, and timing of water delivery to the compensatory mitigation site.

c. *Develop a complete grading plan making use of the hydrology data.* Identify the soil types on site before and after grading. Determine whether soil amendments will be necessary for long-term habitat development; if amendments will be required, determine the most efficacious methods of nutrient delivery over the long-term. Evaluate the grading plan for possible areas of scour and / or deposition of sediment. Modify the grading plan as necessary to establish a site that would likely not erode or fill with sediment during the 25-year or more frequent rainfall events or that would not be adversely affected by subsidence. For estuarine marsh compensatory mitigation sites, changes in sea level and subsidence are key considerations for the long-term development and success of these sites. Add micro- and macro-topographic variation in the grading plan to increase habitat variability.

d. *Develop a draft plant palette based on the compensatory mitigation project purpose, soil types, and hydrology*. Identify tree, shrub, and herbaceous species to be planted, the source of the material, and the number and size of individual plants. Plant stock should be obtained from areas as near the compensatory mitigation site as possible, to preserve the genetic integrity of the area. Plant understory species during the initial planting or at some later date when the canopy cover has reached a specified level. If the understory is planted later, it may be necessary to fell a few trees to create openings in the canopy for these new plants to survive. The Corps strongly recommends that felled trees remain at the mitigation site (along the ground) to serve as a source of decaying coarse woody debris, which is important to systemic nutrient cycling. Vegetation should be planted in clusters and islands that emulate regional reference (i.e., high-functioning) sites; they should not be planted in rows and spaced at regular distances. The Corps can assist applicants in identifying suitable regional reference sites.

In addition to plant types, the proposed irrigation strategy should consider soil type, hydrology, and other relevant factors. Develop a plan to wean plants from irrigation and a monitoring scheme to maintain plant hydration. Examine the possibility of mixing lower cost plant material (cutting of local plants) with a small number of larger container stock to develop vertical heterogeneity (strata). These recommendations are designed to avoid the establishment of tree farms (e.g., large numbers of same-age trees planted in regular rows on six-foot centers).

e. *Propose realistic success criteria based on the purpose of the compensatory mitigation, design of the site, and functional assessment criteria*. Develop measurable success criteria, consistent with the purpose and goals of the compensatory mitigation, that are achievable by the end of the maintenance and monitoring period (generally five years after compensatory mitigation implementation). Include measurable and realistic performance standards to track progress toward achieving the success criteria. Commonly used criteria in past compensatory mitigation monitoring included percent canopy cover, percent plant survival, percent of distinct species that are native, percent canopy cover of non-native species, plant heights, and occurrence / nesting of target species. More recently, functional assessment criteria, such as HGM variables and functional algorithms, have been used in the Los Angeles District to measure compensatory mitigation progress and success. These criteria provide a reliable and objective means of evaluating site characteristics that affect the capacity of habitat to perform site / ecosystem functions. **Development of appropriate success criteria is the single most important element in the development of a successful compensatory mitigation program.** Involve the Corps as early as possible to develop specific, measurable performance standards and success criteria used to evaluate compensatory mitigation site success.

3. Once the applicant has developed a draft compensatory mitigation plan using the items listed above, it should be submitted to the Corps and the other resource agencies. The Corps, after consultation with the resource agencies, will evaluate the draft plan for approval prior to or during permit processing. The Corps will generally not issue a permit without a draft compensatory mitigation plan that has been evaluated and given at least conditional approval. In general, the Corps prefers that the compensatory mitigation site be constructed prior to or concurrently with the project construction. If compensatory mitigation will not be constructed until after project impacts, the Corps will likely increase the mitigation ratio, to minimize temporal loss of functions and values.

D. Compensatory Mitigation Site Construction

1. The actual construction of the compensatory mitigation project shall not begin until the final compensatory mitigation plan has been approved by the Corps in consultation with the resource agencies. Construction efforts for each individual compensatory mitigation site will be dependent on the size of the site, the type of compensatory mitigation (in general, creation involves much more work than enhancement of existing habitat), the amount of earthwork required, and the complexity of the compensatory mitigation plan. The major effort by the applicant during this phase of the project would be to monitor construction activities and to ensure all aspects of the compensatory mitigation plan are completed without incident. This will normally require on-site management of construction personnel by one or more of the applicant's representatives, who have complete knowledge of the compensatory mitigation plan and some understanding of soil science, hydrology, and botany or plant ecology. Sensitive areas should be staked or flagged to preclude construction impacts. The applicant is responsible for the successful implementation of the compensatory mitigation, and any significant deviations identified during construction must be approved by the Corps. The most important items that should be monitored include:

a. *Prior removal of exotic plant species during site preparation*. One of the major expenses during the maintenance phase of any compensatory mitigation project will be the continual battle against exotic plant species, as they invade recently disturbed habitat. If the construction personnel remove the invasive plant material from the site during the initial grading instead of grading it under, there may be less need for intensive maintenance during later stages of the project.

b. *Monitor the planting strategy to ensure vegetation is not planted in linear rows at a regular distance and that onsite conditions will support the species planted over the long-term*. Many existing compensatory mitigation sites have the appearance of tree farms. These sites lack the complex habitat structure important to support a variety of wildlife and to optimally perform hydrologic, biochemical, and habitat functions. Ensure that plant spacing at the compensatory mitigation site emulates what is observed at regional reference (high-functioning) sites. In addition, monitor the elevation of the different plant species and confirm that these trees and shrubs are planted at the designed height relative to the water source supporting them, such as ground water. Confirm the plants are natural members of the surrounding community and not similar ornamental species. Confirm soil conditions (e.g., soil moisture, pH, salinity, etc.) are within limits for species being planted.

c. *Monitor the construction activities to ensure habitat outside of the planned compensatory mitigation site is not impacted*. The use of heavy equipment may be needed to construct the site, and care must be taken to ensure the operator does not stray outside of the project boundaries. Brief the operators of heavy equipment on the location of sensitive habitat areas and the importance of avoidance.

2. Once the construction has been completed, provide as-built drawings (preferably electronic format) to the Corps and other interested resource agencies within 30 days after completion of construction. On these drawings, identify the date the compensatory mitigation site construction was completed and if there were any deviations from the approved compensatory mitigation plan. In addition, it is advisable for the applicant to schedule a compliance visit with the appropriate project manager to confirm the site has been planted adequately.

E. Long-Term Compensatory Mitigation Site Maintenance and Monitoring

1. After the site has been graded and planted, the maintenance and monitoring phase of the compensatory mitigation project begins immediately. This is a very crucial phase of the project, as most compensatory mitigation projects do not develop as expected. Changes in hydrology, water budgets, soil conditions, exotic plant species invasions, disease or pest infestations of vegetation, and other problems can occur on newly established compensatory mitigation sites. Without a comprehensive maintenance and monitoring program, many of these minor problems can quickly spiral out of control and threaten the future success of the compensatory mitigation site.

As discussed above, one of the most important issues with the maintenance and monitoring of compensatory mitigation sites is the ongoing battle against invasive, exotic plant species. In southern California, there are many species of invasive, opportunistic plants that will readily colonize a recently disturbed site that is being provided with extra water during the late spring and summer. Examination of past compensatory mitigation sites found all sites to be impacted to varying degrees by invasive plants. Those sites with higher numbers of invasive, exotic species (generally attributable to infrequent eradication) exhibited reduced habitat functions. A proactive program to remove invasive plants upon discovery would result in higher habitat functions on compensatory mitigation sites. It would also be less costly to the applicant to conduct these removal activities before the density of invasive species becomes a serious problem. Bi-weekly or monthly inspections of the site during the spring and early summer would allow removal of the immature exotic plants before they reproduce and create a much larger problem. In many situations, the site will initially be free of exotics but an adjacent infested property acts as a source of seeds or propagules that continually invade the site. It may be prudent for the applicant to request permission from the adjacent landowner to assist the landowner with removal of the nuisance invasive plant species. Although this may be costly, it can actually reduce overall maintenance costs, as the level of reinvasion by the particular plant species declines. As the native vegetation becomes established, the threat of invasive plant species is reduced along with the removal effort.

2. Provide information to the Corps on all planned maintenance activities, including irrigation system / water delivery structure inspection, plant replacement, weeding, fertilization, erosion control, herbivore protection, trash removal and protection against dumping, and any other such activities. Identify the persons / entities responsible for financing and carrying out maintenance activities, including names, titles, addresses, and phone numbers. Provide these contacts to the responsible Corps Project Manager. Provide a table showing the schedule of maintenance inspections. This information should be included in the final compensatory mitigation plan. Any major problems with the site or deviations to the plan should be reported to the Corps as soon as possible.

3. The most important aspect of the maintenance and monitoring phase of nearly all compensatory mitigation sites is tracking and ensuring the appropriate depth, duration, and timing of water delivery to the site. For riparian compensatory mitigation sites, water availability can be monitored by noting flow in the channel, frequency and level of overbank flooding, and the groundwater levels throughout the year. For these systems, the amount of water and the seasonal availability is important to the type of habitat that is to be restored, enhanced, and / or created. Monthly monitoring (or even bi-weekly) of the site during the first two years would provide important information on site hydrodynamics to determine whether onsite vegetation communities will be stressed or die-off over the long term.

4. The format of the annual monitoring reports is one of the most significant changes in the revised Mitigation Guidelines and Monitoring Requirements. In the past, significant energy and resources were used in the preparation of extensive monitoring reports, which generally have been insufficient for the Corps to evaluate compensatory mitigation projects. In an effort to reduce costs to the applicant, which can then be used for increased site maintenance activities or monitoring practices, the Corps recommends the standard monitoring report be six to eight pages in length, as detailed in Section IV.

IV. MONITORING REQUIREMENTS

Monitoring reports will be required and identified as a special condition for every permit that includes construction of a compensatory mitigation site. Written as formal conditions of Corps permits, monitoring reports will be subject to formal compliance efforts. Failure to submit complete monitoring reports on time could result in suspension of the permit or requirements for additional compensatory mitigation. Non-compliance with Corps permit conditions, which can include additional compensatory mitigation requirements, may be subject to the Corps' Enforcement Procedures (33 CFR 326).

As stated above, the format, content, and length of the compensatory mitigation monitoring reports has been significantly changed. The Corps has decided to change the content and reduce the length to allow the permittee to reduce cost and time spent preparing lengthy reports. While monitoring reports will generally be required on an annual basis, a Project Manager may require more frequent submittals of monitoring reports for specific projects. The Corps wants applicants to spend more time conducting site maintenance and monitoring, in order to identify problems as early as possible. If a problem is identified within a monitoring report, the appropriate Corps Project Manager can schedule a site visit to determine the extent of the problem and to identify remedial measures. These shorter monitoring reports can then be made part of the official case file leading to improved regulatory documentation of permit compliance and compensatory mitigation success.

The required compensatory mitigation reports shall be a minimum of six pages and a maximum of eight pages. The following information shall be included within the report on the specific pages described below:

Pages 1-2:

A. Project Information
1. Project Name.
2. Applicant name, address, and phone number.
3. Consultant name, address, and phone number (for permit application, if necessary).
4. Corps permit file number.
5. Acres of impact and type(s) of habitat impacted (or proposed for impact).
6. Date project construction commenced (or proposed to begin).
7. Location of the project and directions to site (including latitude/longitude or UTM coordinates).
8. Date of the report and the corresponding permit conditions pertaining to the compensatory mitigation.
9. Amount and information on any required performance bond or surety.

B. Compensatory Mitigation Site Information

1. Location and directions to the site (including latitude/longitude or UTM coordinates).
2. Size and type(s) of habitat existing at the site and proposed for restoration, enhancement, and/or creation.
3. Stated purpose/goals for the compensatory mitigation site.
4. Date site construction and planting completed.
5. Dates of previous maintenance and monitoring visits.
6. Name, address, and contact number of responsible agent for the site.
7. Name, address, and contact number for designer.

C. Brief Summary of Remedial Action(s) and Maintenance of the Compensatory Mitigation Site

Page 2 or 3:

A. Map of the compensatory mitigation site
1. 8 1/2 Diagram of the site including:
   a. Habitat types (as constructed).
   b. Locations of photographic record stations.

c. Landmarks.
d. Inset defining location of the site.

Page 3 or 4:

A. List of Corps-approved success criteria.

B. Table of results from the monitoring visits versus performance standards for specified target dates.

Page 4, 5, and/or 6:

A. Photographic record of the site during most recent monitoring visit at record stations (at least four photos on at least one page, no more than two pages)

Page 5, 6, or 7:

A. Summary of field data taken to determine compliance with performance criteria. At least one page, no more than two pages.

Page 6, 7, or 8 (if needed):

A. Summary of any significant events that occurred on the site that may affect ultimate compensatory mitigation success.

The completed monitoring reports should be submitted unbound to the Corps for inclusion into the official case file. Electronic copies of these reports can be submitted in lieu of written reports and may be required in the future.

V. COMPLETION OF MITIGATION

A. When the monitoring period is complete and the applicant believes final success criteria have been met, the Corps should be notified in writing. Where appropriate, a formal jurisdictional delineation of the created wetland area should be submitted with the report (this delineation shall be accompanied by legible copies of all field data sheets). Following receipt of the final report, the Corps will contact the applicant (or agent) as soon as possible to schedule a site visit to confirm the completion of the compensatory mitigation effort and any jurisdictional delineation. The compensatory mitigation will not be considered complete without an on-site inspection by a Corps representative and written confirmation that success criteria have been achieved.

VI. CONTINGENCY MEASURES

A brief discussion of the following items shall be part of each annual or the final compensatory mitigation monitoring report, unless the compensatory mitigation site is achieving or has achieved all articulated success criteria:

A. If an annual performance standard is not met (as identified in the Corps-approved final compensatory mitigation plan) for all or any portion of the compensatory mitigation project in any year, or if the final success criteria are not met, the applicant shall prepare an analysis of the cause(s) of failure(s) and, if determined necessary by the Corps, propose remedial actions for approval. If the compensatory mitigation site has not met one or more of the success criteria or performance standards, the responsible party's maintenance and monitoring obligations shall continue until the Corps gives final project approval.

B. Alternative Locations for Contingency Compensatory Mitigation. Indicate specific alternative compensatory mitigation locations that may be used in the event that compensatory mitigation cannot be successfully achieved at the intended compensatory mitigation site. Include current ownership information, if offsite.

C. Funding Mechanism. Indicate what funds will be available to pay for planning, implementing, and monitoring of any contingency procedures that may be required to achieve compensatory mitigation goals.

D. Responsible Parties. List names, addresses, and phone numbers of persons/entities responsible for implementing and monitoring contingency procedures.

VII. ACKNOWLEDGEMENTS

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California Map of U.S. Army Corps of Engineers Regulatory Boundaries

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